

## Visual-recognition systems will allow machines to 'see'

**Abstract: Supercomputers at LANL that simulate a human's visualization process may soon boost technology to automate driving and making life generally easier and safer.**

A computer may one day take over the steering wheel of your car during a driving emergency and get you to safety. That's if a scientific effort to simulate human vision is successful.

Studying the process of vision by using the world's fastest supercomputer, researchers at Los Alamos National Laboratory are getting a radically new view of what it takes to see an object and figure out what it is.

Research at Los Alamos on how the brain processes what a person sees is made possible by Roadrunner, a computer capable of a thousand-trillion calculations a second. In fact, it's nearly as fast as the human brain.

With this computing power, a Los Alamos team is starting to fill in the blanks in computer programs that attempt to simulate a human's visualization process. Current programs only get it right 90 percent of the time.

"Imagine that when you cross the street, 10 percent of the time what you thought was a billboard was actually an oncoming truck," says Luis Bettencourt, leader of the Synthetic Visual Cognition Project at Los Alamos. That 10-percent gap is the current standard for state-of-the-art computer programs running visual-recognition patterns.

When this gap is closed, robots will be able to navigate cities and even individual buildings without hitting obstacles. And, eventually, the success of the program may let computers steer you out of harm's way during an emergency on the road.

In collaboration with researchers at MIT and other scientific institutions, the Los Alamos team is exploring ways to improve the understanding of how a brain processes visual information. And they want to apply that knowledge to the virtual world of synthetic processes.

In a human, visual information enters through the cornea, which focuses images onto the retina at the back of the eye. There, photoreceptors convert light to electric signals used by the brain's neurons to communicate with each other. These signals shoot to the back of the brain and are processed by the visual cortex. There emerges a picture of the object just viewed by the cornea.

"We know a lot about the brain, but we still don't really know how it works," says Garrett Kenyon, a Los Alamos neuroscientist. As this research unfolds—work partly funded by the National Science Foundation—the hope is that brain function will become much less mysterious.

Replicating this process in a computational system may provide a whole new idea of how visual-recognition patterns adapted to artificial intelligence will make life easier and safer.